

ANNUAL REPORT FOR 2003



Lengyel Mitigation Site
Craven County
Project No. 8.1170806
TIP No. B-2531WM



Office of Natural Environment & Roadside Environmental Unit
North Carolina Department of Transportation
December 2003

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SUMMARY

The following report summarizes the activities that have occurred in the fifth consecutive year of hydrology and vegetation monitoring at the Lengyel Mitigation Site. The Lengyel Mitigation Site is a brackish marsh restoration/preservation site that is divided into two areas. The first area is a reference marsh ecosystem (preservation) that contains two surface water gauges and one groundwater gauge. The second area is a restoration site that also contains two surface water gauges and one groundwater gauge. The reference marsh serves as a baseline to determine hydrologic success if the restoration area does not meet established success criteria.

The 2003-year represents the fifth year of hydrologic monitoring for the Lengyel Mitigation Site. Hydrologic data collected for the surface gauges revealed continuous saturation/inundation for a period exceeding 25% of the growing season.

The success criteria for vegetation sampling follow the most recent guidelines from the National Marine Fisheries Service. The 2003 vegetation monitoring revealed a combined frequency of 81% for *Spartina cynosuroides*, *Juncus* sp., and *Scirpus* sp.

The 2003-year represents the fifth successful year of monitoring, therefore NCDOT proposes to discontinue vegetation and hydrology monitoring of the Lengyel Mitigation Site.

1.0 INTRODUCTION

1.1 Project Description

The Lengyel Mitigation Site is a 13.198-acre brackish marsh restoration/preservation project located in Craven County, North Carolina. The site is located east of the intersection of US 70 and US 70 Business and provides compensatory mitigation for impacts associated with the construction of the US 17 Neuse River Bridge (TIP No. B-2531) (Figure 1). Mitigation goals for the site include approximately 6.54 acres of brackish marsh restoration, 5.25 acres of brackish marsh preservation, and 0.85 acres of upland buffer. The site was constructed in April of 1998; however, planting activities were not complete until April 1999.

1.2 Purpose

In order to demonstrate successful mitigation, hydrologic and vegetative monitoring must be conducted for a minimum of five years. Vegetation success criteria are based on the National Marine Fisheries Service guidelines. Hydrologic success criteria are based on federal guidelines for wetland mitigation. The following report details the results of hydrologic and vegetation monitoring during the 2003 growing season at the Lengyel Mitigation Site. Included in this report are analyses of hydrologic and vegetative monitoring results, discussion of local climate conditions throughout the growing season, and updated site photographs.

1.3 Project History

April 1998	Site Construction Initiated
April 1998	Site Planted (Phase I)
March 1999	Surface Water Gauges Installed
April 1999	Planting Completed (Phase II)
June 1999	Site Construction Finished
April-November 1999	Hydrologic Monitoring (1 yr.)
October 1999	Vegetation Monitoring (1 yr.)
March-November 2000	Hydrologic Monitoring (2 yr.)
August 2000	Vegetation Monitoring (2 yr.)
October 2000	Two Groundwater Gauges Installed
March-November 2001	Hydrologic Monitoring (3 yr.)
August 2001	Vegetation Monitoring (3 yr.)
March-November 2002	Hydrologic Monitoring (4 yr.)
July 2002	Vegetation Monitoring (4 yr.)
March-November 2003	Hydrologic Monitoring (5 yr.)
September 2003	Vegetation Monitoring (5 yr.)

1.4 Debit Ledger

Table 1. Lengyel Mitigation Site Debit Ledger

Site Habitat	Mitigation Plan			TIP Debit
	Acres at Start	Acres Remaining	% Remaining	B-2531
Marsh restoration	7.2	5.64	78.33	1.56
Marsh preservation	4.7	4.7	100.00	
Total	11.9	10.34	86.89	

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2.0 HYDROLOGY

2.1 Success Criteria

The hydrologic success criteria established for the Lengyel Mitigation Site includes: 1) site inundation or saturation within 12 inches of the ground surface for 25 percent of the growing season, or should the restoration fail to meet this criteria, 2) statistical comparison between the reference marsh area and the restoration area to determine if hydrology is significantly different. The site specific criteria are more stringent than the current federal guidelines that require a site to be inundated or saturated (within 12" of the surface) by surface or groundwater for a consecutive 5 - 12.5% of the growing season. Areas inundated or saturated less than 5% of the growing season are classified as non-wetlands.

The growing season in Craven County begins on March 18 and ends November 14. The dates correspond to a 50% probability that the temperature will drop to 28° F or lower after March 18 and before November 14.¹ Thus the growing season is 240 days; the established minimum hydrology requires 25% of this season, or 60 days. Local climate must represent average conditions for the area.

2.2 Hydrologic Description

A combination of wave action, wind-driven tides, rainfall, and high water is expected to keep the marsh consistently inundated; therefore, surface gauges were installed to record surface water levels. Four surface water gauges were installed at the site on March 31, 1999 (Figure 2). Automatic readings are taken at three-hour intervals daily throughout the growing season. Two groundwater gauges were installed on October 2, 2000 to maintain compliance with the CAMA, USACE, and NCDWQ permit conditions. The groundwater gauges record water levels on a daily basis. No rain gauge is located on the site, so rainfall data from a New Bern rain gauge (data supplied by the NC State Climate Office) is used to supplement the site's data. The data collected in 2003 represents the fifth full growing season for hydrologic monitoring.

2.3 Results of Hydrologic Monitoring

2.3.1 Site Data

The maximum number of consecutive days that saturation occurred within 12 inches of the ground surface was determined for each groundwater-monitoring gauge. This number was converted into a percentage of the 240-day growing season (March 18 – November 14).

¹ Soil Conservation Service, Soil Survey of Craven County, North Carolina, 1989.

Figure 2. Lengyel Gauge Location Map

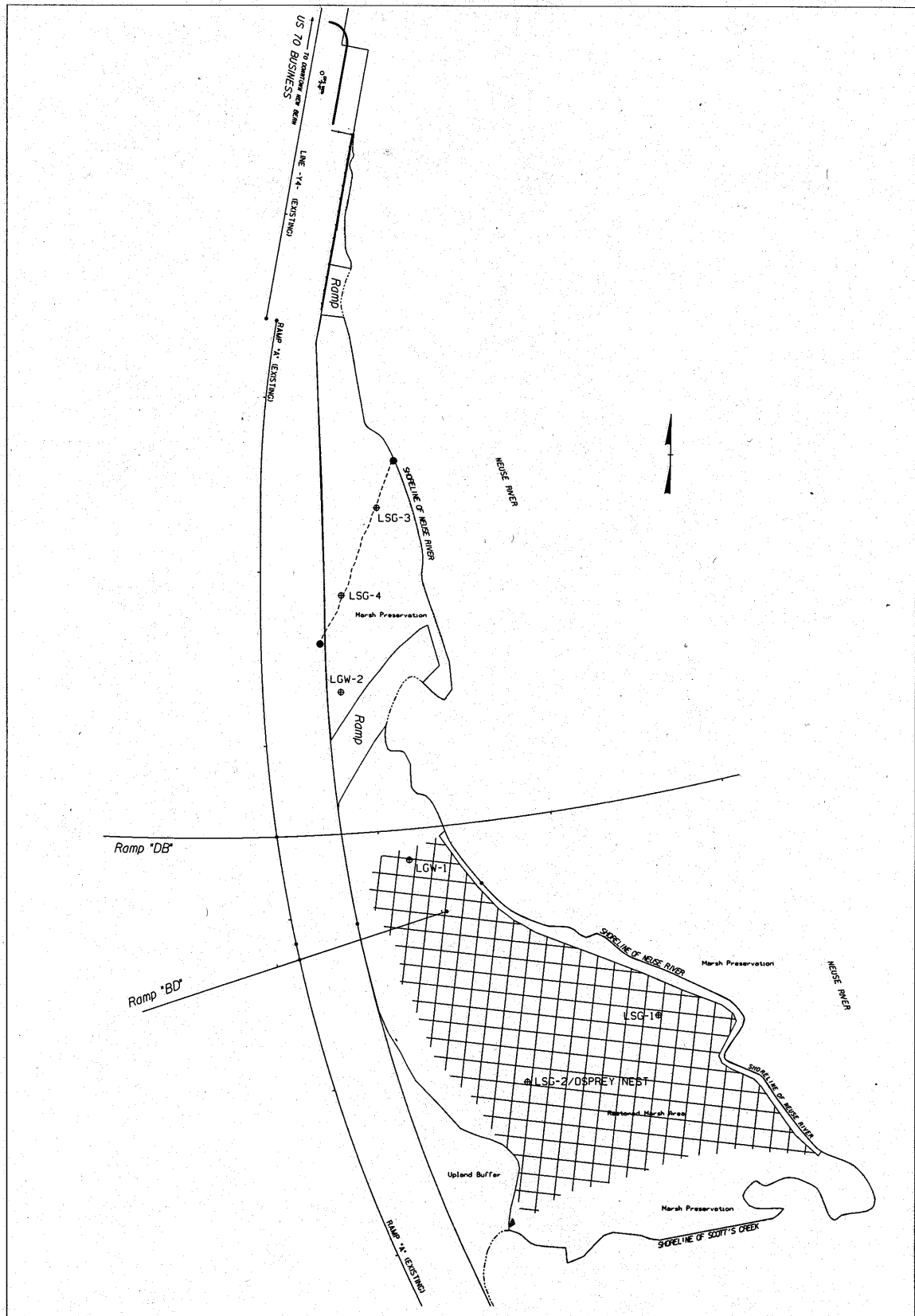


Table 2. 2003 Hydrologic Monitoring Results

Monitoring Gauge	< 5.0%	5.0 – 12.5%	12.5 - 25.0%	> 25.0%	Actual %
LSGW1+				×	52.5
LSGW2+				×	100
LSG1				×	61.4
LSG2				×	70
LSG3				×	69.8
LSG4*				×	36.3

Shaded gauges are reference gauges.

+ Gauge met success criteria during an average rainfall month (March and August).

* Gauge read out of range data for the majority of the growing season.

Table 3. (1999- 2002) Hydrologic Monitoring Results

Monitoring Gauge	1999 Results	2000 Results	2001 Results	2002 Results
LSGW1	Exceeded 25%	Exceeded 25%	39.6	40.5
LSGW2	Exceeded 25%	Exceeded 25%	31.7	52.9
LSG1	Exceeded 25%	Exceeded 25%	100	100
LSG2	Exceeded 25%	Exceeded 25%	100	100
LSG3	Exceeded 25%	Exceeded 25%	100	100
LSG4	Exceeded 25%	Exceeded 25%	100	100
Climate Conditions	Below average rainfall	Average Rainfall	Average to below average rainfall	Average Rainfall

Table 3 represents hydrologic data in percentages from the previous years of monitoring (1999-2002). The site exceeded the 25% success criterion in 1999 and 2000; however, the actual percentages were not recorded in the reports.

Appendix A contains charts of the water depth for each surface and groundwater gauge during 2003. The groundwater monitoring gauge graphs are also designed to show the reaction of groundwater to specific rainfall events. All significant saturation periods are noted on the groundwater gauge graphs, as are daily precipitation events measured at the New Bern rain gauge. Rainfall events are not included on the surface gauge graphs. These plots are designed to show periods of site inundation.

2.3.2 Climatic Data

Figure 4 is a comparison of the 2003 monthly rainfall to the historical precipitation (collected between 1972 and 2003) for New Bern, North Carolina. This comparison gives an indication of how 2003 relates to historical data in terms of climate conditions. The NC State Climate Office provided all local rainfall information.

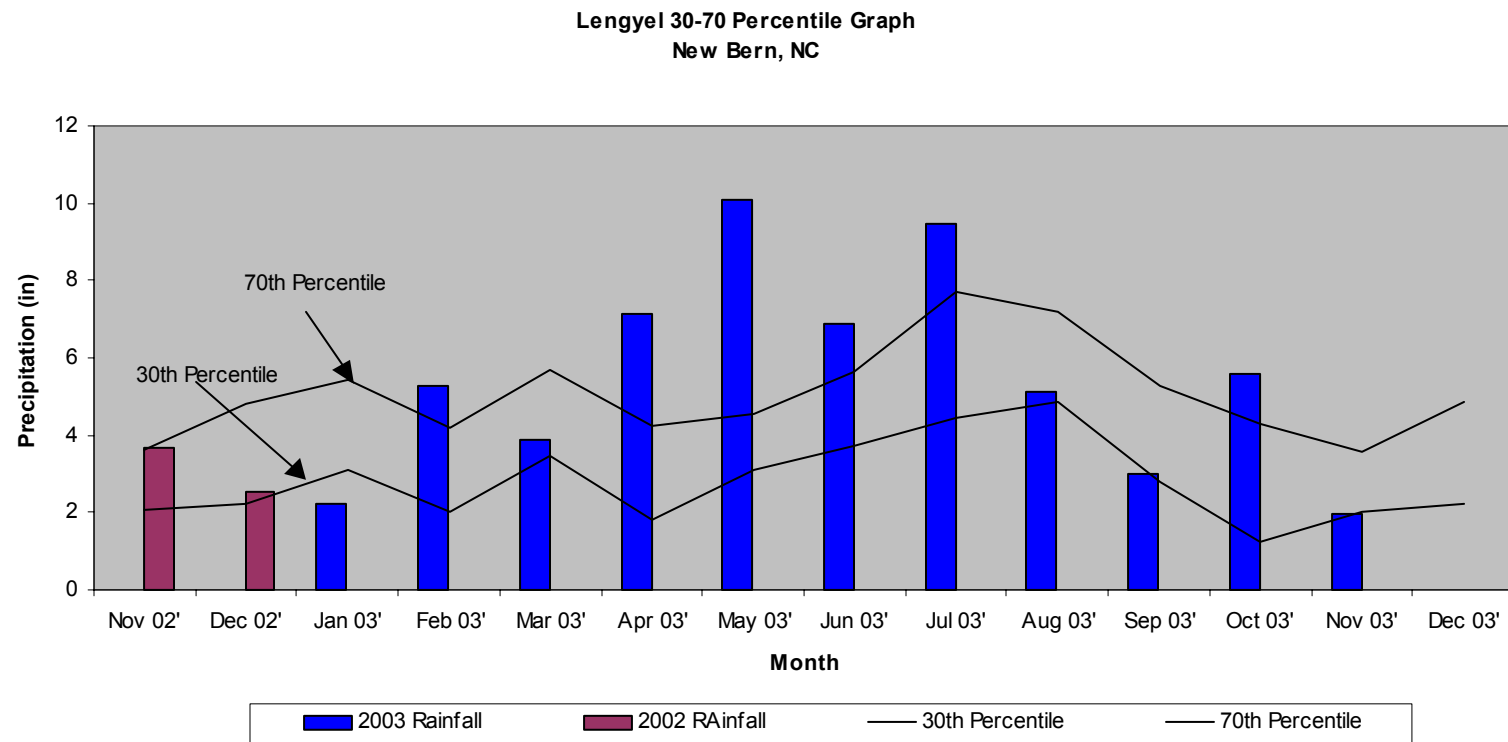
For the 2003-year, February, April, May, June, July, and October experienced above average rainfall. The months of January, September, and November recorded below average rainfall for the site. November (02'), December (02'), March, and August experienced average rainfall. Overall, 2003 experienced an average rainfall year.

2.4 Conclusions

The 2003-year represents the fifth year of hydrologic monitoring for the Lengyel Mitigation Site. Hydrologic data collected for the surface gauges showed continuous saturation/inundation for a period exceeding 25% of the growing season. Gauges 1-4 indicated inundation for 61.4%, 70.0%, 69.8%, and 36.3%, respectively. One surface gauge read out of range data for the majority of the growing season. Monitoring data collected from the two groundwater-gauges showed continuous saturation (within 12" of the surface) for a period exceeding 25% of the growing season. The 2003 data was collected during an average rainfall year.

NCDOT proposes to discontinue hydrology monitoring at the Lengyel Mitigation Site.

Figure 4. Lengyel Site 30-70 Percentile Graph, New Bern, NC



3.0 VEGETATION: LENGYEL MITIGATION SITE (YEAR 5 MONITORING)

3.1 Success Criteria

The vegetative marsh success of the wetland site will be determined in accordance with NMFS Guidelines. Monitoring plots found to be located within the open water channel will not be evaluated, and will not count toward the final count of plots. The vegetation component of the wetland site will be deemed successful if the following criteria are met:

1. At year five, the average of all plots should have a scale value of 5 (75% vegetative cover) consisting of wetland herbaceous species, not including any invasive species.
2. A minimum of 70% of the plots shall contain the target (planted) species.

3.2 Description of Planted Areas

The following plant species was planted in the Marsh Grass Area:




































































Marsh Planting: Approximately 2.46 hectares (6.1 acres)

Spartina cynosuroides, Big Cordgrass

3.3 Results of Vegetation Monitoring

Table 4. Vegetation Monitoring Statistics

ZONE	Plot #	Scale Factor	<i>Spartina cynosuroides</i>	<i>Scirpus</i> sp.	<i>Juncus</i> sp.	Frequency (Big Cordgrass only)	Notes
	1	5.0					Goldenrod, Wax myrtle
	2	5.0					Goldenrod, <i>Panicum virgatum</i>
	3	5.0					Goldenrod, Smooth Cordgrass, <i>Baccharis halimifolia</i>
	4	5.0					<i>Baccharis halimifolia</i> , Smooth Cordgrass
	5	0.0					Open Water
	6	5.0					Goldenrod, Wax myrtle, Smooth Cordgrass
	7	5.0					<i>Baccharis halimifolia</i> , Goldenrod
	8	0.0					Out of Bounds
	9	5.0					Goldenrod, <i>Baccharis halimifolia</i>
	10	5.0					Goldenrod, <i>Baccharis halimifolia</i>
	11	5.0					<i>Aster</i> sp.
	12	5.0					Goldenrod, <i>Baccharis halimifolia</i>
	13	4.0					Goldenrod, <i>Baccharis halimifolia</i>
	14	5.0					Goldenrod, <i>Baccharis halimifolia</i> , <i>Panicum virgatum</i>
	15	4.0					<i>Pluchea</i> sp., Smooth Cordgrass
	16	5.0					Goldenrod, <i>Baccharis halimifolia</i>
	17	5.0					<i>B. halimifolia</i> , <i>Aster</i> sp., Smooth Cordgrass
	18	5.0					<i>B. halimifolia</i> , Wax myrtle, Goldenrod
	19	0.0					Open Water
	20	4.0					<i>Panicum virgatum</i> , Goldenrod, Wax myrtle
	21	5.0					Goldenrod, <i>Baccharis halimifolia</i>
	22	5.0					Smooth Cordgrass, <i>Aster</i> sp.
	23	5.0					Goldenrod, <i>Baccharis halimifolia</i>
	24	5.0					Smooth Cordgrass, <i>Aster</i> sp.
	25	5.0					<i>Sagittaria</i> , <i>Aster</i> sp.
	26	5.0					Goldenrod
	27	5.0					Goldenrod, <i>Baccharis halimifolia</i>
	28	4.0					Goldenrod, <i>Baccharis halimifolia</i> , Phragmites, Smooth Cordgrass
	29	5.0					Goldenrod
	30	4.0					Goldenrod, <i>Panicum virgatum</i>
	31	5.0					Goldenrod, Wax myrtle
	32	5.0					<i>Panicum virgatum</i>
	33	0.0					Out of Bounds
	34	5.0					Wax myrtle
	35	5.0					Goldenrod, <i>Baccharis halimifolia</i>
	36	5.0					
	37	0.0					Open Water
	38	5.0					
	39	5.0					Goldenrod, <i>Baccharis halimifolia</i>
	40	5.0					Goldenrod, <i>Baccharis halimifolia</i>
	41	5.0					Goldenrod, Wax myrtle
	42	0.0					Open water
	43	5.0					Goldenrod
	44	4.0					Goldenrod, <i>Panicum virgatum</i>
	45	0.0					Open water

ZONE	Plot #	Scale Factor	<i>Spartina cynosuroides</i>	<i>Scirpus</i> sp.	<i>Juncus</i> sp.	Frequency (Big Cordgrass only)	Notes
	46	5.0					Goldenrod
	47	5.0					<i>Baccharis halimifolia</i> , Smooth Cordgrass
	48	5.0					<i>Baccharis halimifolia</i> , <i>Pluchea</i> sp.
	49	4.0					<i>Baccharis halimifolia</i>
	50	5.0					<i>Baccharis halimifolia</i> , <i>Aster</i> sp., Goldenrod
	51	5.0					<i>Baccharis halimifolia</i> , <i>Panicum virgatum</i>
	52	5.0					Goldenrod, Smooth Cordgrass
	53	5.0					<i>Aster</i> sp., Smooth Cordgrass
	54	5.0					Goldenrod, Smooth Cordgrass
	55	0.0					Open Water
	56	5.0					Goldenrod
	57	5.0					<i>Pluchea</i> sp.
	58	5.0					Smooth Cordgrass
	59	5.0					<i>Baccharis halimifolia</i>
	60	0.0					Open Water
	61	5.0					<i>Aster</i> sp.
	62	0.0					Open Water
	63	5.0					Goldenrod, Smooth Cordgrass
	64	5.0					Goldenrod, Smooth Cordgrass, <i>Aster</i> sp., <i>Panicum virgatum</i>
	65	5.0					Goldenrod
	66	5.0					<i>Baccharis halimifolia</i> , <i>Aster</i> sp., Smooth Cordgrass
	67	5.0					<i>Aster</i> sp.,
	68	5.0					Wax myrtle
	69	5.0					<i>Aster</i> sp., Smooth Cordgrass
	70	5.0					<i>Baccharis halimifolia</i> , <i>Aster</i> sp.
	71	5.0					<i>Baccharis halimifolia</i> , Goldenrod
	72	5.0					<i>Aster</i> sp.,
	73	5.0					<i>Aster</i> sp., Goldenrod
	74	4.0					<i>Baccharis halimifolia</i> , Goldenrod
	75	5.0					<i>Baccharis halimifolia</i> , Goldenrod
	76	5.0					Goldenrod
	77	5.0					Smooth Cordgrass
	78	5.0					Goldenrod
	79	5.0					Goldenrod
	80	5.0					Goldenrod
	81	5.0					<i>Aster</i> sp., Goldenrod
	82	5.0					Goldenrod
	83	5.0					<i>Baccharis halimifolia</i> , <i>Pluchea</i> sp.
	84	5.0					Smooth Cordgrass, Wax myrtle
	85	5.0					Wax myrtle
	86	5.0					<i>Aster</i> sp., Smooth Cordgrass
	87	5.0					Goldenrod
	88	5.0					<i>Aster</i> sp., Smooth Cordgrass, Goldenrod, <i>Baccharis halimifolia</i>
	89	5.0					<i>Aster</i> sp., Smooth Cordgrass, <i>Baccharis halimifolia</i>
	90	0.0					Out of Bounds

ZONE	Plot #	Scale Factor	<i>Spartina cynosuroides</i>	<i>Scirpus</i> sp.	<i>Juncus</i> sp.	Frequency (Big Cordgrass only)	Notes
	91	5.0					Goldenrod, <i>Baccharis halimifolia</i>
	92	5.0					<i>Aster</i> sp., Smooth Cordgrass
	93	5.0					<i>Panicum virgatum</i> , <i>Baccharis halimifolia</i>
	94	5.0					<i>Aster</i> sp., Smooth Cordgrass
	95	0.0					Out of Bounds
	96	5.0					<i>Aster</i> sp.
	97	3.0					<i>Panicum virgatum</i> , <i>Baccharis halimifolia</i> , Goldenrod
	98	5.0					Goldenrod, Wax myrtle
	99	5.0					Phragmites, Black willow, Goldenrod, <i>Panicum virgatum</i>
	100	5.0					Goldenrod, Baldcypress
	101	5.0					<i>Panicum virgatum</i> , Goldenrod
	102	5.0					Goldenrod, Morning Glory
	103	5.0					<i>Aster</i> sp.
	104	0.0					Open Water
	105	5.0					Wax myrtle
	106	5.0					<i>Panicum virgatum</i> , Goldenrod
	107	5.0					Goldenrod
	108	5.0					<i>Aster</i> sp., <i>Sagittaria</i> sp.
	109	5.0					Marsh-elder
	110	5.0					<i>Aster</i> sp.
Frequency (Percentage of Plots with Desired Species)			27.8%	44.3%	51.5%	27.8%	
Sum Scale Value						475	
Total Number of Plots						97	
Vegetative Cover (Scale Value)						4.9	

Site Notes: Site appears to be converting to mostly *Juncus* and *Scirpus* species. 44.3% frequency of *Scirpus* sp. and 51.5% frequency of *Juncus* sp.

3.4 Conclusions

- Percent Frequency of Target Species (Big Cordgrass) **27.8%**
Frequency of 70% required.
- Vegetative Cover Scale Value **4.9**
Scale Value of 5 required for year 5.

Of the 4.8 hectares (11.9 acres) on this site, approximately 2.46 hectares (6.1 acres) involved marsh planting. The percent frequency of target species is 27.8%. The cover scale value is 4.9.

Based on the 2003 vegetation monitoring, the frequency of *Spartina cynosuroides* has increased since last year. However, the site appears to be converting to a marsh system dominated primarily by *Juncus* species (51.5% frequency) and *Scirpus* species (44.3% frequency). The 2003 vegetation monitoring revealed a combined frequency of 81% for *Spartina cynosuroides*, *Juncus* sp., and *Scirpus* sp. Based upon this combined frequency, NCDOT feels that the mitigation goals for the vegetation restoration as stated in the Final Wetland Mitigation Plan (August 2000) are being met.

The open water channel within the site was measured with GPS equipment in 2001 and is shown on the attached map.

NCDOT proposes to discontinue vegetation monitoring at the Lengyel Mitigation Site.

4.0 OVERALL CONCLUSIONS/RECOMMENDATIONS

The 2003-year represents the fifth year of hydrologic monitoring for the Lengyel Mitigation Site. Hydrologic data collected for the surface gauges showed continuous inundation for a period exceeding 25% of the growing season. One surface gauge read out of range data for the majority of the growing season. Monitoring data collected from the two groundwater-gauges showed continuous saturation (within 12" of the surface) for a period exceeding 25% of the growing season. The 2003 data was collected during an average rainfall year.

The fifth year of vegetation monitoring revealed that the percent frequency of target species (27.8%) did not meet that specific success criterion. However, the site appears to be converting to a marsh system with a combined percent frequency of 81% for *Spartina cynosuroides*, *Juncus* sp., and *Scirpus* sp. Based upon this combined frequency, NCDOT feels that the mitigation goals for the vegetation restoration as stated in the Final Wetland Mitigation Plan (August 2000) are being met.

The 2003-year represents the fifth successful year of monitoring, therefore NCDOT proposes to discontinue hydrology and vegetation monitoring on the Lengyel Mitigation Site.

APPENDIX A

GAUGE DATA GRAPHS

APPENDIX B

SITE PHOTOS

LENGYEL



Photo 1



Photo 2



Photo 3



Photo 4



Photo 5



Photo 6

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